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**MATURATION AND RIPENING
OF 'DOYENNE DU COMICE' PEARS**

A thesis presented in partial fulfilment of
the requirements for the degree of
Master of Applied Science
in
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*To my wife Mary, who gave me
the most precious treasures
in my life: herself and our children*

Abstract

Characterisation of fruit quality attributes before and at harvest, during coolstorage and during ripening was made using standard and new, non-destructive devices during both the 1996 and 1997 seasons. Fruit firmness was linearly related to time when measured either by 'Kiwifirm' or penetrometer before harvest.

Destructive techniques, the penetrometer and the texture analyser, were used to measure firmness and compared with non-destructive devices, the Kiwifirm and the softness meter. It is suggested that expressing rates of softening will be much more straightforward using a device such as the Kiwifirm. This device and the softness meter provided firmness data for pears that were too soft to measure by penetrometer.

The effects of harvest date (1, 11 and 21 March, 1996) and three crop loads on fruit maturity after a period of 6 weeks in coolstorage were investigated. Fruit size increased considerably during the 20 days before harvest, suggesting that periodical harvests need to be made in order to pick optimum size fruit each time. Maturity at harvest influenced the quality of 'Comice' stored at 0°C in air. Fruit from different harvests behaved differently in terms of softening behaviour and colour changes after 6 weeks in coolstorage. Crop load did not affect fruit quality attributes assessed after coolstorage.

The characterisation of the nature and degree of within-tree and between tree fruit variability in harvest maturity and final ripening behaviour of 'Doyenne du Comice' pear was assessed by measuring firmness and colour. These attributes were measured non-destructively on fruit from different positions on the trees, and subsequently measured at harvest and during ripening at 20°C after 7 weeks in coolstorage at 0°C in air. Fruit behaved differently in terms of softening behaviour and colour changes depending on their position on the tree. Fruit maturity was delayed when fruit came from shaded areas, fruit from inner locations were greener than fruit from the outside and top positions.

Selective picking and the association of harvest and ripening data may be important in making predictions that could reduce variability in fruit quality in the market place.

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1. INTRODUCTION

Pears are an attractive option for fruit growers in New Zealand. Pears exports for the year ended 30 June 1995 were valued at \$12.5 million which was a 115% increase over 1994 (Witters, 1995). Although the volume of New Zealand pears is small compared to apple production, it is recognised that pears offer exciting opportunities for niche marketing in the future.

‘Doyenne du Comice’ (Comice) is one of the most attractive export cultivars in the New Zealand pear industry. A problem associated with the commercial development of this cultivar has been recognised: fruit quality variation in the market place. Fruit with different levels of firmness, rates of softening, colour and total soluble solids content are some of the problems reported. Some of these problems may greatly be reduced by improvements in the postharvest cool chain, but it is suspected that significant variation may arise in the orchard, linked with preharvest factors such as fruit position within the tree canopy and crop load on the tree.

Fruit development can be affected by position within the tree; several components of fruit quality are correlated with fruit growth (Chalmers, 1985). The complexity of the nature of quality and the diversity of factors affecting fruit on the tree, make it necessary to analyse variation of fruit quality in terms of a number of attributes. Moreover, these attributes are usually highly correlated since biological systems contain many components which are interrelated. The use of multivariate analyses is particularly well-adapted to this type of situation (Broschat, 1979).

In the current study, maturation and ripening behaviour of ‘Comice’ pears have been characterised to determine if there are any correlations between non-destructive and destructive maturity assessments that might eventually be used to segregate pears on the grading line. These characterisations could be important in making predictions that could reduce variability in fruit quality in the market place.

It is known that the harvest date or harvesting at the proper stage of fruit maturity has a great influence on the quality of fruit stored for a long period (Eccher Zerbini *et al.* 1993; Elgar *et al.* 1997). Little is known about effects of fruit position within the tree, crop load and harvest date on fruit quality after storage. In the present

study these relationships were analysed.

The objectives of the present study were to:

- characterise maturation and ripening of 'Comice' pears, particularly softening behaviour;
- investigate the influence of harvest date, position on tree and crop load on quality of 'Comice' pears after coolstorage;
- determine the effects of crop load and fruit position on the tree on maturity of 'Comice' pears at harvest and after coolstorage.